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Nanoshell Assembly for Magnet-Responsive Oil-Degrading Bacteria

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Abstract

© 2016 American Chemical Society.The modified polyelectrolyte-magnetite nanocoating was applied to functionalize the cell walls of oil decomposing bacteria Alcanivorax borkumensis. Cationic coacervate of poly(allylamine) and 20 nm iron oxide nanoparticles allowed for a rapid single-step encapsulation process exploiting electrostatic interaction with bacteria surfaces. The bacteria were covered with rough 70-100-nm-thick shells of magnetite loosely bound to the surface through polycations. This encapsulation allowed for external manipulations of A. borkumensis with magnetic field, as demonstrated by magnetically facilitated cell displacement on the agar substrate. Magnetic coating was naturally removed after multiple cell proliferations providing next generations of the cell in the native nonmagnetic form. The discharged biosurfactant vesicles indicating the bacterial functionality (150 ± 50 nm lipid micelles) were visualized with atomic force microscopy in the bacterial biofilms.

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